



**Environmental  
Operations, Inc.**

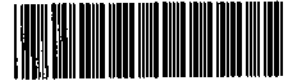
07YX  
Site ST Louis Army Amm Plant Slapp  
ID # MO4210021222  
Break: 2.1  
Other: 4-22-05

April 22, 2005

EOI Project #1692

Chris Cady, PhD  
Brownfields/Voluntary Cleanup Program  
Missouri Department of Natural Resources  
PO Box 176  
Jefferson City, Missouri 65102-0176

40236993



SUPERFUND RECORDS

Re: Calculated Background Soil Concentrations  
Former St. Louis Army Ammunition Plant  
St. Louis, Missouri

Dear Mr. Cady:

The purpose of this letter is to summarize our recent communications and efforts concerning the use of calculated metal concentrations for the above referenced subject site. As with several other Missouri Department of Natural Resources ("MDNR") Brownfields/Voluntary Cleanup Program ("B/VCP") project sites that Environmental Operations, Inc. is currently involved, total mercury concentrations have become a significant chemical of concern ("COC") under the draft Missouri Risk-Based Corrective Action Technical Guidance ("MRBCA") document. Our current remedial strategy for closure of this site includes the comparison of historic environmental analytical data to calculated background concentrations of mercury. The following sections describe the methods of background concentrations, reasoning in using the formulas and comparisons with the draft MRBCA and Cleanup Levels for Missouri ("CALM") documents.

### **Background Concentration**

The U.S. EPA Risk Assessment Guidance for Superfund Sites (RAGS; U.S. EPA, 1989) recognizes that there are two types of background chemical:

1. Naturally occurring chemical concentrations that have not been influenced by humans
2. Chemicals that are present due to anthropogenic sources

At sites located within or adjacent to industrialized areas, certain chemicals, such as metals, may have been distributed in soil by human activities. Establishment of natural background, in these locations, is not possible. Therefore, concentrations of chemicals in soil may be from anthropogenic influences.

Environmental Consulting & Remediation

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4/22/05 10:00 AM

A dataset of ten surface samples were collected from local municipal parks (i.e., five samples each from Penrose and Dwight Davis Parks). While it cannot be demonstrated conclusively that these soil samples were not influenced by human activities, the samples can be used to establish background concentrations, as provided in RAGS (U.S. EPA, 1989).

The discussions that have transpired recently have focused on which subset of the ten samples to consider in the calculation of background concentration for use in establishing background concentration for use at the St. Louis Army Ammunition Plant, and which statistical method to use to establish background concentration. Using Dixon's Extreme Value Test with the dataset of ten samples, it was determined that two of the ten samples were outliers for mercury concentrations (i.e., BKSB-08 and -09). Therefore, it is recommended that these two data be removed from the dataset used to establish background.

The statistical approach to use in order to establish a single number that represents background concentration is commonly either the 95% upper confidence limit (UCL) or the 95% upper tolerance level (UTL). The 95% UCL represents the concentration when there is 95% confidence that the interval contains the true population mean. The 95% UTL represents the concentration that 95% of the population will fall below with 95% confidence. Commonly the 95% UTL is used by states (e.g., Texas) to establish background concentrations, whereas the 95% UCL for a soil datasets is used to compare to a specified criteria to demonstrate whether the soil is protective of soil ingestion and inhalation (TNRCC, 1998). The 95% UCL and 95% UTL concentrations for the dataset are presented in Tables 1 and 2. As can be noted, the two compare favorably with 95% UTL approximately 25% to 30% higher than the 95% UCL. For comparison, the 95% UCL and 95%UTL are presented using all ten samples, all but the highest sample result (i.e., 9 of the 10 samples), and all but the highest two sample results (i.e., 8 of the 10 samples).

**Table #1: Calculated Mercury Background Concentrations**

URS Sample Number	Mercury Concentration (mg/Kg)		
	n = 8	n = 9	n = 10
BKSB-01 (0-0.5)-902	0.039	0.039	0.039
BKSB-02 (0-0.5)-902	0.037	0.037	0.037
BKSB-03 (0-0.5)-902	0.03	0.03	0.03
BKSB-04 (0-0.5)-902	0.025	0.025	0.025
BKSB-05 (0-0.5)-902	0.084	0.084	0.084
BKSB-06 (0-0.5)-902	0.065	0.065	0.065
BKSB-07 (0-0.5)-902	0.097	0.097	0.097
BKSB-08 (0-0.5)-902	<i>high not included</i>	<i>high not included</i>	0.35
BKSB-09 (0-0.5)-902	<i>second high not included</i>	0.18	0.18
BKSB-10 (0-0.5)-902	0.03	0.03	0.03
Sum	0.407	0.587	0.937
Mean (x)	0.051	0.065	0.094
Standard Deviation (s)	0.0275	0.05015	0.1017
k (look up table, n)	3.188	3.031	2.911
n = number of samples	8	9	10
95% UCL ( $x + 1.96*s$ )	0.105	0.164	0.293
95% UTL ( $x + k*s$ )	0.139	0.217	0.390

**Proposed Cleanup Objective for Mercury**

Based on the above calculations, it would be a conservative estimate to remove the highest concentrations from the 95% UCL or UTL calculations. Using the remaining eight background soil samples would result in a conservative approach to calculation of site specific background concentrations. Based on this information, we are anticipating use of UTL calculated levels for comparison of site confirmation sample analytical results. Thus, the mercury concentration representing the 95% UTL is 0.139 mg/Kg, and this concentration will be considered as the project cleanup objective for mercury.

For comparison, the attached table compares the calculated background concentrations to target cleanup levels under scenarios within MRBCA and CALM. As indicated in the table, the proposed site cleanup objective for mercury lies well within the range of acceptable levels for this particular land use and scenarios under these programs.

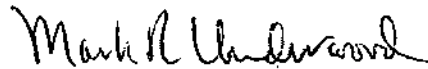
As we have discussed in the past, we are interested in closing this site using residential target levels (i.e., unrestricted site use). Based on a comparison to the released target levels, we feel this is still achievable using the calculated background levels for site cleanup objectives.

If you have any questions concerning this matter, please call me. As you are aware, these cleanup objectives will be included in the forthcoming Remedial Action Plan ("RAP"), which is part of the Administrative Consent Order for this property transfer. I would like to make sure all interested parties are in agreement with this matter prior to submitting the RAP.

Sincerely,



David Bushong  
Environmental Engineer



Mark R Underwood, PhD  
Professional Geologist

Attachment

cc: Scott Halcy, Koman Properties  
Robert Wilkinson, Husch Eppengerger

Cleanup Target Levels and Calculated Concentrations	Cleanup Scenario	MRBCA Residential						MRBCA Non-Residential						CALM				95% UCL (x + 1.96*s)	95% UTL (x - 1.96*s)
		Soil Type 1		Soil Type 2		Soil Type 3		Soil Type 1		Soil Type 2		Soil Type 3		Scenario A	Scenario B	Scenario C	Leaching to Groundwater		
	Surficial- combined pathways	Subsurface- indoor inhalation	Surficial- combined pathways	Subsurface- indoor inhalation	Surficial- combined pathways	Subsurface- indoor inhalation	Surficial- combined pathways	Subsurface- indoor inhalation	Surficial- combined pathways	Subsurface- indoor inhalation	Surficial- combined pathways	Subsurface- indoor inhalation							
	Mercury	0.463	0.00784	0.692	0.019	0.931	0.0343	6.3	0.063	6.3	0.153	6.3	0.276	0.6	0.8	1	3.2	0.105	0.139

**Dave Bushong**

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**From:** Chris Cady [chris.cady@dnr.mo.gov]  
**Sent:** Friday, April 29, 2005 4:35 PM  
**To:** Dave Bushong  
**Cc:** Jim Harris  
**Subject:** Hg Background

Dave:

Thanks for the 4/22 proposal for Hg background. I think this approach will work for the SLAAP site. I just spent a day at a MRBCA meeting and one topic was background. It has not been decided whether "natural" or "anthropogenic" background must be considered. CALM specified natural only, but in practice, we have worked with anthro. in certain cases such as PAHs in urban soils.

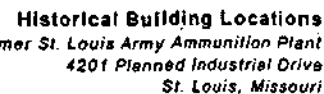
I have researched the UTL vs. UCL including the info you sent from TNRCC. I think the approach will work fine, particularly since the samples were collected nearby.

I believe URS did an outlier analysis to exclude high values - on this basis you would exclude the two high values?

Thanks,

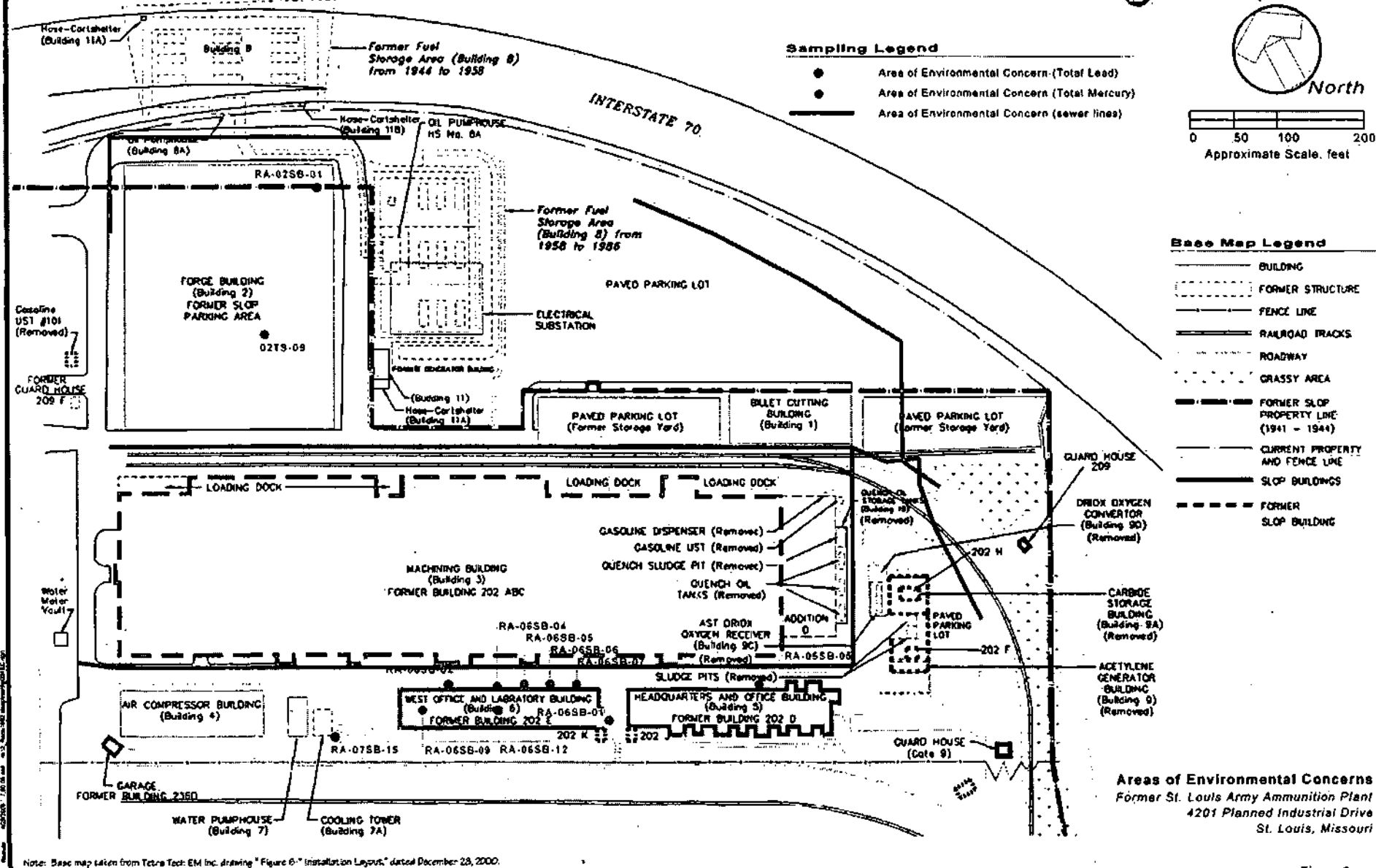
Chris Cady, Ph.D.  
Environmental Specialist  
Brownfields/Voluntary Cleanup Section  
Hazardous Waste Program  
(573) 526-8916

5/2/05



Note: Base map taken from Tetra Tech EMI Inc. drawing "Figure 6-1 Installation Layout," dated December 28, 2000.

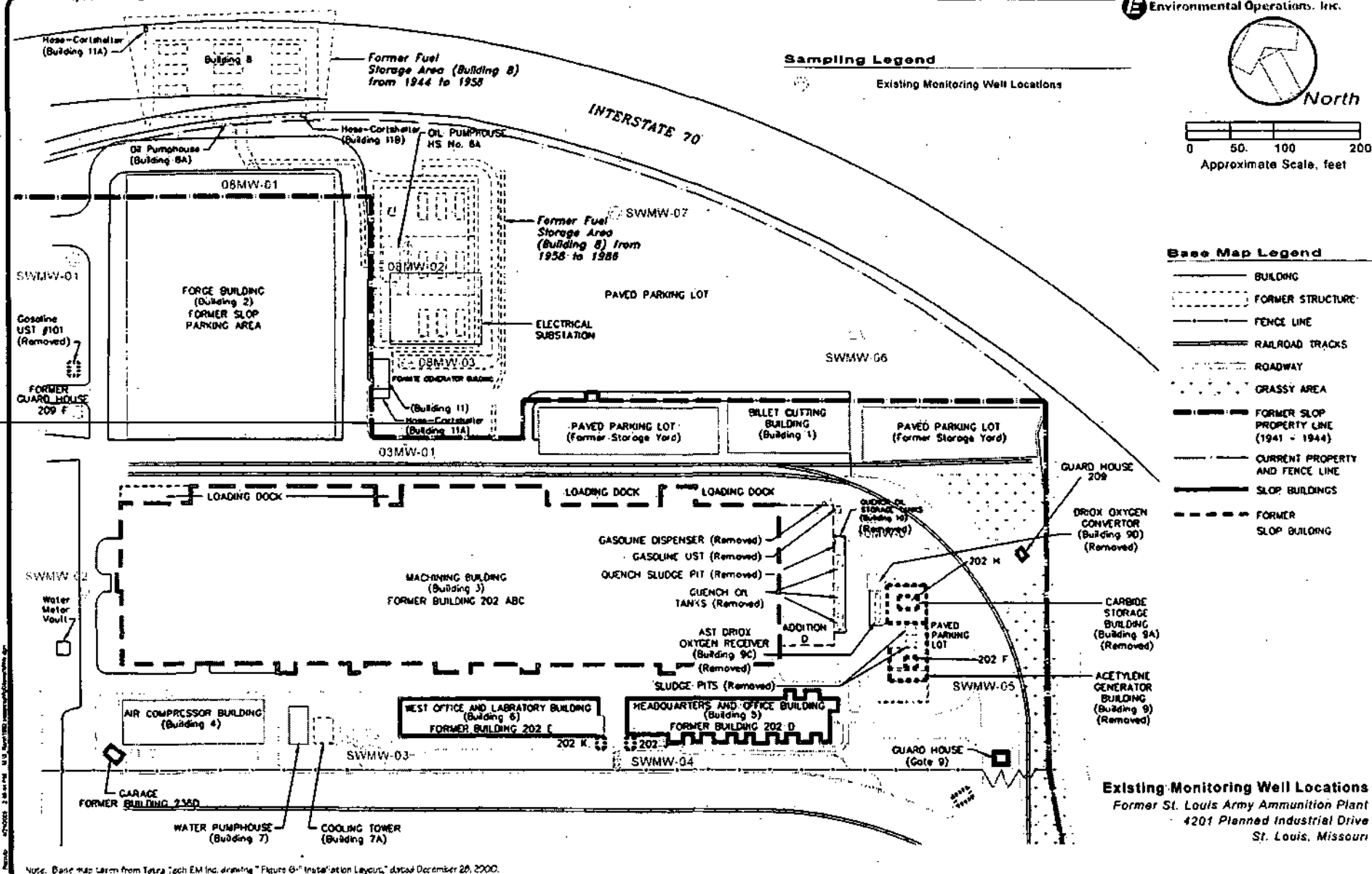
**Figure 2**



Note: Base map taken from Tetra Tech: EM Inc. drawing "Figure 6: Installation Layout," dated December 28, 2000.

Figure 3





**Figure 4**



Jim Harris  
<jim.harris@dnr.mo.gov>  
06/03/05 11:18 AM

To: Thomas Lorenz/SUPR/R7/USEPA/US@EPA  
cc:  
bcc:  
Subject: Fw: Comments on SLAAP RAP

For Follow Up: Normal Priority

fyi

Jim Harris  
Environmental Specialist  
Department of Natural Resources  
Phone: (573) 526-2736  
E-mail: jim.harris@dnr.mo.gov

----- Forwarded by Jim Harris/HWP/DEQ/MODNR on 06/03/2005 11:17 AM -----  
Chris Cady/HWP/DEQ/MODNR

06/02/2005 05:07 PM

To: daveb@environmentalops.com  
Jim Harris/HWP/DEQ/MODNR@MODNR, Jim  
cc: Belcher/HWP/DEQ/MODNR@MODNR  
Subject: Comments on SLAAP RAP

Dave:

As we discussed today, here is a summary of initial comments and questions on the draft SLAAP RAP you emailed 5/20. There are some issues I am still working on, but I wanted to get started. We can discuss later how much of this should be formalized in a letter, etc. At this point we will save time through informal discussions on these topics.

Please forward as appropriate.

SLAAP RAP Comments  
6/2/05  
C. Cady BVCP

1. Background Conc'n Appendix: On Table 2, it might be helpful to outside audiences to include "sand, silt and clay" with Soil Types 1, 2 and 3. The background method is what we previously agreed to, this looks fine.
2. Proposed Sampling Plan:
  - Pg 2, Areas of Env. Concern: the first line, suggest adding "investigation and remediation have been performed."
  - AEC 4, Regulated USTs: I will renew discussions with Tanks Section on where we are at and who is going to be the PM on this. It could reside in Tanks or with BVCP.

- Global replace "VCP" with "BVCP" (all documents)
- I assume that the sampling will help determine soil removal amounts; please indicate in the sampling report (prior to soil remediation) the proposed limits of excavation and volumes to be excavated.

### 3. RAP

- Pg. 2, Para. 2: address given as 4201 Planned Indust. Drive. The EBS had an address of 4800 Goodfellow, and DNR has followed that convention. Suggest we use that for the time being; or, fill us in on how the addresses will look after redevelopment – maybe we should change now?
- Pg. 9, Sewer Lines: End of first paragraph, change "elevated sediments" to "contaminated" or "affected".
- Pg. 10, Groundwater Monitoring: Paragraph 2 states wells will be "properly purged." Please elaborate.
- Pg. 10, Remed. Objectives: Note the MRBCA stds. are draft right now. We expect minor changes to some numbers prior to finalization. Before remediation begins, or when final RAP is approved by BVCP, updated MRBCA stds. should be reviewed and applied at that time. Note we do not expect major changes that would radically affect remediation.
- Pg. 12, Excavation Waters and Surface Waters: (minor point) First sentence has a singular-plural problem. The plan here is fine, please inform BVCP of any discharge to MSD. Include brief description of volume, contaminants treated (if any) before discharge and how treated, and include a copy of the MSD permit in the remediation report.
- Pg. 12, Disturbed Soils Plan: After our discussion today, I discussed this with Jim Harris. BVCP is OK with relocating/consolidating soil in one area and capping; however, (something I did not think to mention) we generally prefer this not be done in a clean area. Such projects usually consolidate in an already contaminated area. However, we may be able to accommodate and should further discuss if you proceed in this direction. If a capped cell is made, we would want the following: marker, such as orange plastic fencing, below and above the affected soil; survey to document elevation of top and bottom of affected soil; a soil management plan should the soil be disturbed; and documentation in the chain of title such as a deed notice which may include the soil mgt. Plan. It is up to you how you choose to do this project, but it may be advantageous to dispose of the soil in a landfill unless the volume is overwhelming. Perhaps the choice will become more clear as the project develops.
- Pg. 12, Dist. Soils Plan, third sentence: (add) "This plan would address the actions which would be required if affected subsurface soils are excavated and are not returned to their original depths."

4. Has anyone been to the site recently to find out whether URS on behalf of the Army has removed the piles inside Bldg. 2? Jim H. thinks they may have done that. Also the drums in Building 1.

### 5. Building 2 Issues:

- It sounds like you do not yet have a copy of the letter approving remelt of the steel. We will provide a copy of that. I would like it stated in the RAP that it has been approved for remelt, not reuse as is (I believe that is the case based on the letter).
- Removal of the transite panels on the outside of Bldg. 2 as well as all other asbestos abatement onsite should be included in the RAP as it is a hazardous substance that falls under the

BVCP universe. As you know from other projects, we do not get too heavily involved in critiquing and approving highly detailed ACM RAPS, nor are we asbestos inspectors, because ACM abatement is heavily regulated elsewhere. However, we can't ignore it. Therefore we need a description in the RAP of how the panels will be removed and disposed, and how fiber and dust release will be prevented during that process.

6. Regarding the floor in Bldg. 2: Is there a plan for ultimate disposition? Jim H. says there is a honeycomb of voids (basement/crawlspace/pipe runs) under it. Therefore, even if fill is added, it could not be built upon as is. It may have to be broken up and/or the voids filled. I think we have discussed previously, and maybe the plan has not yet gelled. This is not a haz substance issue except on the issue of whether the concrete is a waste or clean fill, but we are curious what the plan is.

7. There are various areas I have not delved into in detail yet. Specifically I want to review soil data from the EBS and make sure I understand the proposed soil remediation areas. I also have not reviewed the proposed sampling density on the floors in Bldg. 2. Probably others. As I mentioned, I wanted to get the comments to you that I have at this point so everyone knows we are on the case. I will be delving into those details asap.

BVCP will be the MDNR authority for RAP approval. I am keeping Jim Harris in the loop though because he is as we all know a walking encyclopedia of the site. He has no other comments I know of at this point. We have not discussed with EPA (yet).

Thanks and have a good weekend. I am out Friday.

Chris Cady, Ph.D.  
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Brownfields/Voluntary Cleanup Section  
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